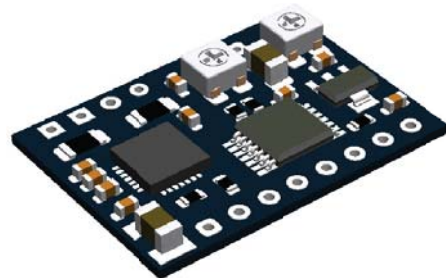




User Manual

UIM24301
Voltage Control
Subminiature Stepper Motor Controller



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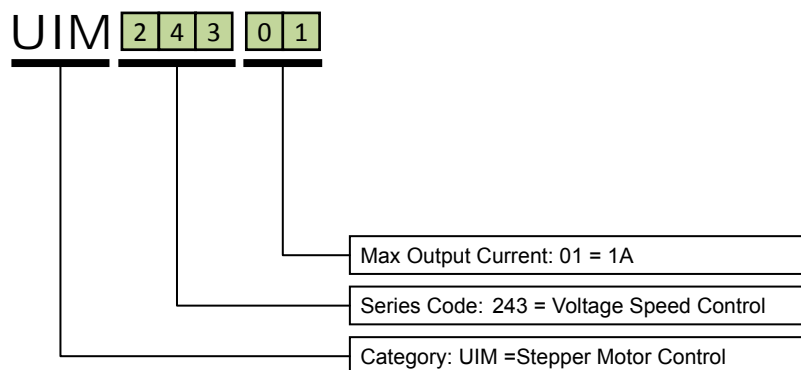
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[UIM24301 Order Information]

In order to serve you quicker and better, when order UIM24301 controller, please provide the product part number in the following format.

UIM24301 PART NUMBERING



UIM24301 Voltage Control Stepper Motor Controller

UIM24301 Voltage Control Subminiature Integrated Stepper Motor Controller

Subminiature Design

- Size 25mm x 18mm x 3mm (L x W x H)
- DIP18 land pattern, 15.24mm wide

Motor Driver Features

- 10 - 30VDC input voltage, Max 1A adjustable phase current
- 8th micro-stepping
- Dual full H-bridge with PWM constant current control

Control Features

- Embedded microcontroller
- Self pulse generation, automatic run on power-up
- Speed control through on-board trimmer, external potentiometer or, voltage input, 1 - 1000 RPM
- Acceleration function
- Switch control run/stop, direction, enable/shutdown
- Automatic current reduction / power saving

Description

UIM24301 stepper motor controller is a microprocessor embedded, voltage control, miniature stepper motor controller.

With the UIM24301, the motor speed can be controlled by an analog voltage in three optional ways: 1) the on-board trimmer, 2) an external potentiometer or, 3) an external voltage. Run/stop, direction, high/low speed range and, enable/disable can be controlled simply by shorting the corresponding terminal to the ground. UIM24301 controllers can run the motor without user control device.

The microprocessor of the UIM24301 is capable to ramp up the current speed to the desired speed within 0.5 seconds, even when the speed control voltage is changing. This feature makes the sudden increase of the desired speed become possible.

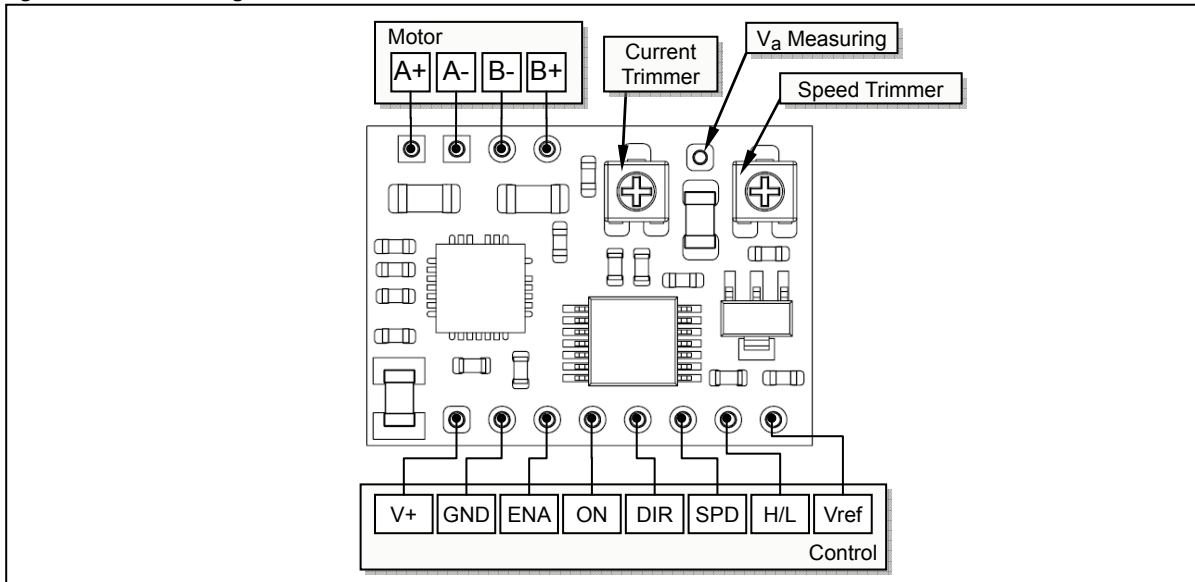
UIM24301 can provide 0 - 1A adjustable phase current. Their mixed-decay current control reduces the back-EMF effect under high motor speed and improves the performance.

UIM24301 can be mounted onto user PCB through soldering or DIP18 socket.

Terminal Description

UIM24031 Wiring Terminal

Figure 0-1: UIM4031 wiring terminal




Control Terminal

Terminal	Symbol	Description
1	V+	Supply voltage 10 - 30VDC
2	GND	Supply voltage ground
3	ENA	Enable/Disable H-bridge, Internally pulled up
4	ON	Run/Stop, internally pulled up
5	DIR	Direction input, internally pulled up
6	SPD	Speed Control Voltage input (0 – 5V)
7	H/L	High / Low Speed Range selection, internally pulled up
8	Vref	5V Reference Voltage output (NEVER link Vref to GND)

Motor Terminal

Terminal	Description
A+ / A-	Connect to the stepper motor phase A
B+ / B-	Connect to the stepper motor phase B



To avoid damaging, make sure the phase winds are connected correctly.
 Resistance between leads of different phases is usually > 100KΩ.
 Resistance between leads of the same phase is usually < 100Ω.

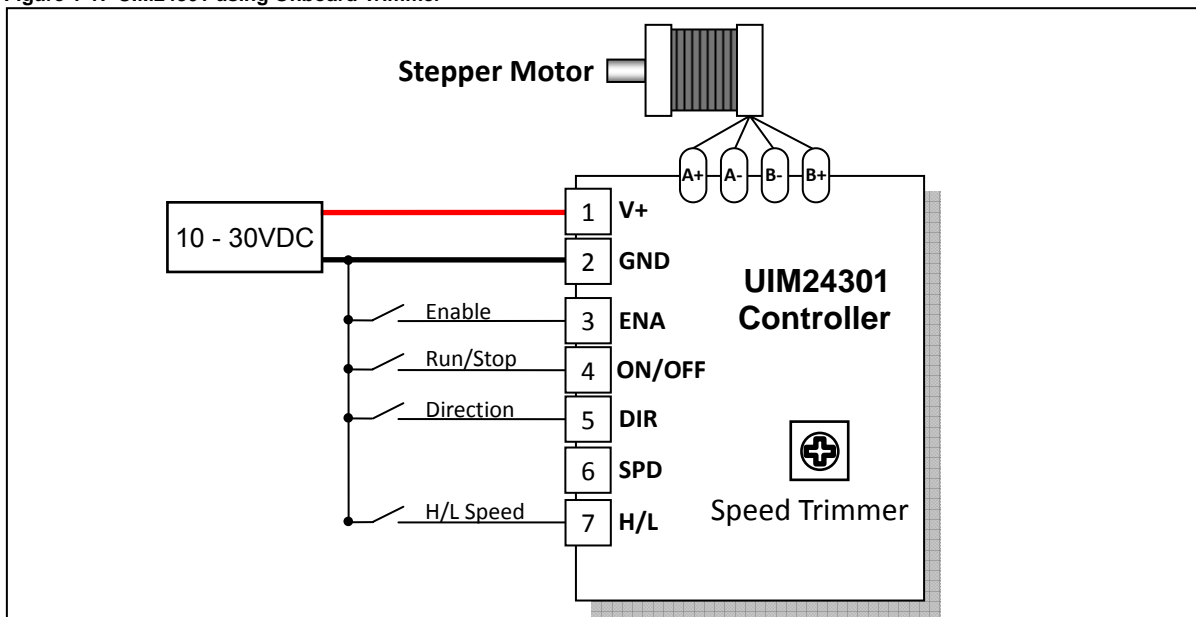
UIM24301 Voltage Control Stepper Motor Controller

Typical Application

UIM24301 controller is equipped with a million-cycle speed adjusting trimmer. It also allows the user to use an external potentiometer or external voltage to control the speed.

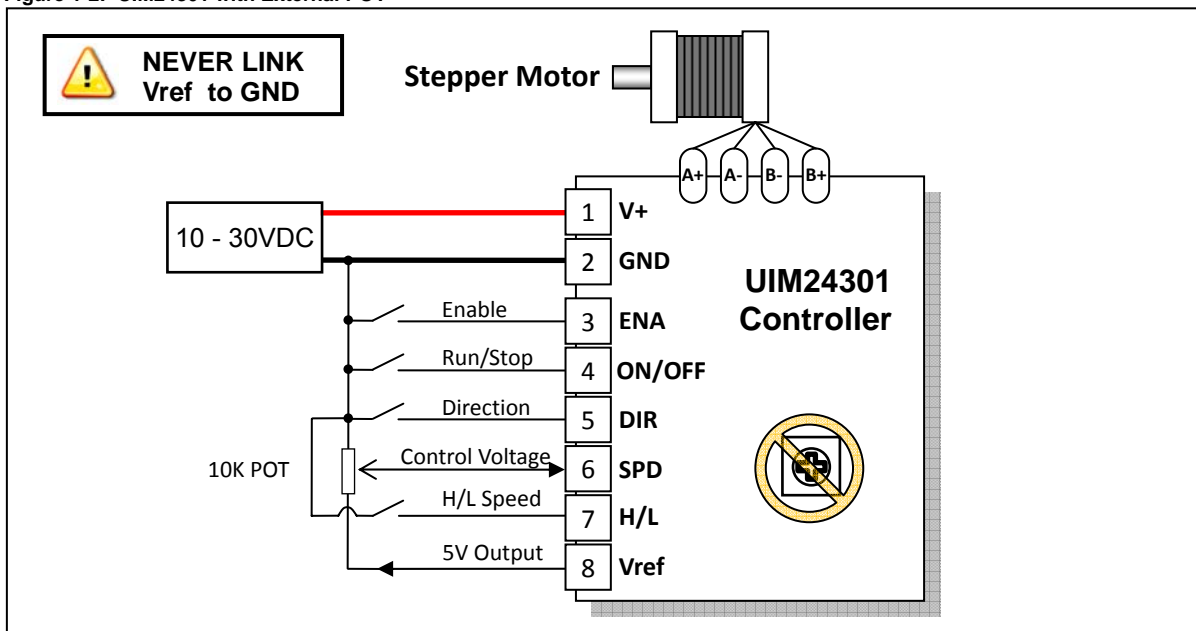
UIM24301 using Onboard Trimmer

Figure 1-1: UIM24301 using Onboard Trimmer



UIM24301 with External POT (on-board trimmer needs to be removed)

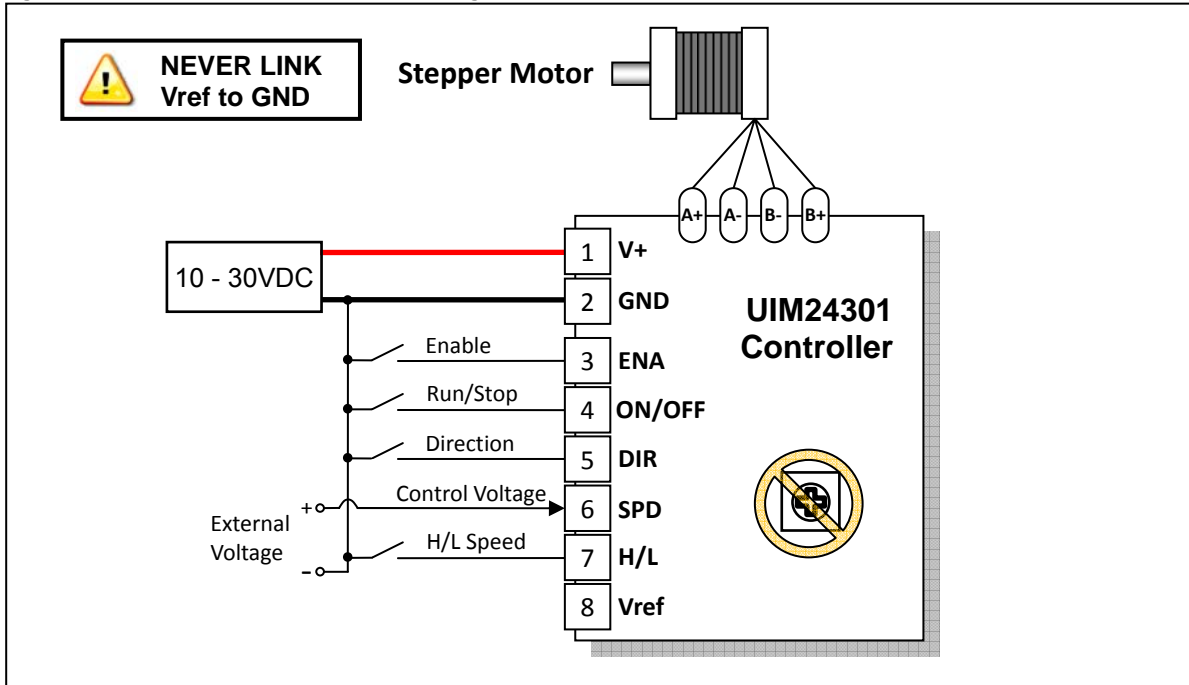
Figure 1-2: UIM24301 with External POT



For users need to use external potentiometer (POT) to control the speed, UIM24301 provides a 5V reference voltage output, and a speed control voltage input port. The resistance of the POT should be between 5K and 10K ohms. Less than 5K will result in excessive power consumption, and larger than 10K will cause inaccurate measurement.

UIM24301 with External Control Voltage (on-board trimmer needs to be removed)

Figure 1-3: UIM24301 with External Control Voltage



For users want to use an external voltage to control the speed to facilitate the needs such as microprocessor D/A control, UIM24301 provides a speed control voltage input port. The external control voltage must share the common ground with the UIM24301 controller. In other words, the ground of the external control voltage must be linked to the terminal 2. In addition, the external control range must between -0.3V and 5.3V. Voltage outside the range will only produce smoke.

UIM24301 Voltage Control Stepper Motor Controller

Characteristics

Absolute Maximum Ratings ^(†)

Supply Voltage.....	10V to 30V
Ambient temperature under bias.....	-40°C to +85°C
Storage temperature.....	-50°C to +150°C

†NOTICE: Stresses above those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Electrical Characteristics (Ambient Temperature 25°C)

Supply Power Voltage	10 - 30VDC
Motor Output Current	Max 1A per phase (Adjustable through on-board trimmer)
Driving Mode	PWM constant current
Stepping Resolution	8th fixed
Insulation Resistance	>100MΩ
Dielectric Strength	0.5KV in one minute
Speed Range	21 – 27000 Hz, 1 - 1000 RPM (1.8° Motor)

Environment Requirements

Cooling	Free Air	
Working Environment	Environment	Avoid dust, oil mist and corrosive gases
	Temperature	-40 °C - + 85 °C
	Humidity	<80%RH, no condensation, no frosting
	Vibration	3G Max
Storage Temperature	-40 °C - + 150 °C	

Size and Weight

Size	25mm x 18mm x 3mm (L x W x H)
Wight	0.03 kg

Functional Description

Supply Voltage

UIM24301 controller accepts a wide range input voltage from 10 to 30VDC.

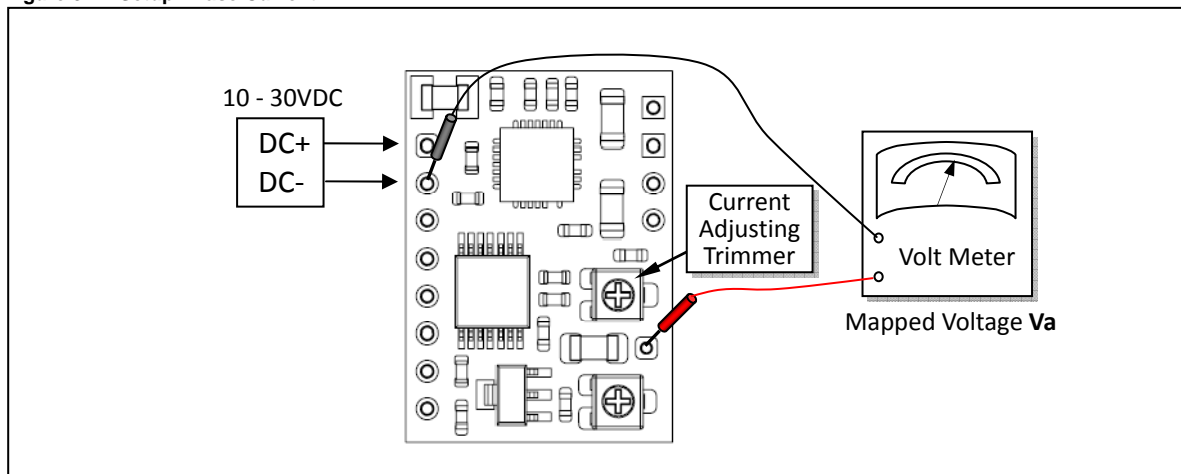
Output Phase Current

UIM24301 is capable of providing a maximum 1A phase output current. In a specific application, the peak output current needs to be adjusted to meet the rated motor current. A trimmer (potentiometer) is provided to serve this purpose as shown in the figure 3-1. Measuring the mapped voltage (V_a) when tuning the trimmer provides a easy way to set the output current.

A mapped voltage “ V_a ” of 0 – 2 V proportionally represents 0 – 1 A.

Please note that, the controller needs to be powered before mapped voltage “ V_a ” can be measured. Reboot of the controller is required after the setup the phase current.

Figure 3-1: Setup Phase Current



Speed Control

UIM24301 onboard processor is able to produce 21 – 27000 Hz step driving pulses. Under 8th micro stepping, that pulse rate equal to 1 – 1000 RPM for a 1.8 degree stepper motor. UIM24301 provides three methods to adjust the speed:

Onboard trimmer

For UIM24301, adjusting the onboard trimmer will give the desired motor speed.

External potentiometer

For users who need to use external potentiometer (POT) to control the speed, UIM24301 provides a 5V reference voltage output, and a speed control voltage input port. The resistance of the POT should be between 5K and 10K ohms. Less than 5K will result in excessive power consumption, and larger than 10K will cause inaccurate measurement.

External control voltage

For users want to use an external voltage to control the speed to facilitate the needs such as microprocessor D/A control, UIM24301 provides a speed control voltage input port. The external control voltage must share the common ground with the UIM24301 controller. In other words, the ground of the external control voltage must be linked to the terminal 2. In addition, the external control range must between -0.3V and 5.3V. Voltage outside the range will only produce smoke.

UIM24301 Voltage Control Stepper Motor Controller

Speed Range Selection

To preserve the accuracy of the measurement of the speed control voltage, the user should select the proper speed range. Since the voltage measurement accuracy is 8bit, (UIM24301 uses a 10bit A/D converter, and abandon the last 2 digits to suppress the noise), the speed adjusting is not continuous, but has an incremental of 1/255 of the max speed.

High Speed Range

When the desired speed is high, the high speed range should be selected, by leaving the terminal 5 open (i.e., not connected) or linking to 5V.

The high speed range is: 500 – 27000 Hz, 20 – 1000 RPM for 1.8 degree stepper motor.

Low Speed Range

When the desired speed is low, the low speed range should be selected, by linking the terminal 5 to ground (i.e., terminal 2).

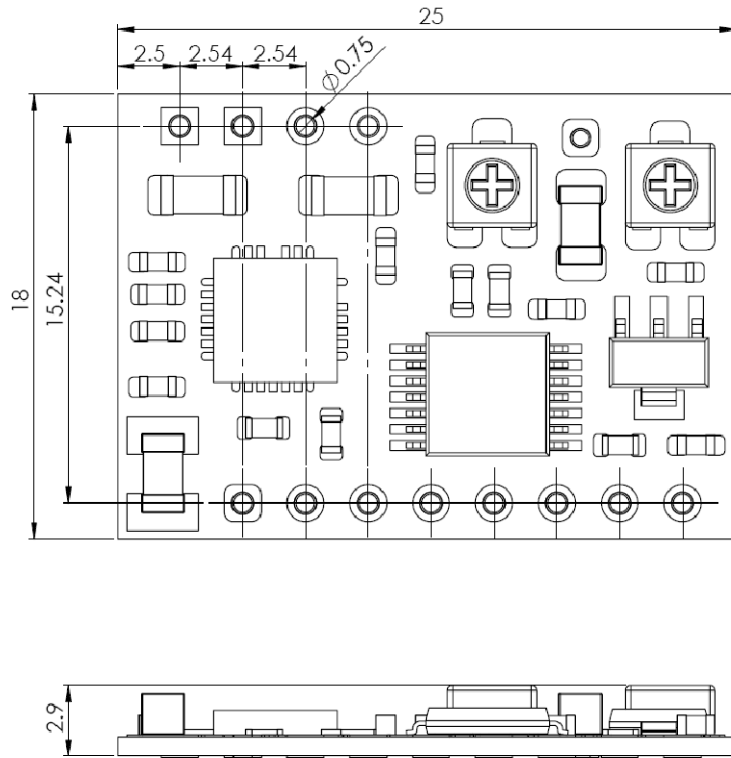
The low speed range is: 21 – 2500 Hz, 1 – 90 RPM for 1.8 degree stepper motor.

Acceleration / Deceleration

The microprocessor of the UIM24301 is capable to ramp up the current speed to the desired speed in 0.5 seconds, even when the speed control voltage is changing. This feature makes the sudden increase of the desired speed become possible.

To guarantee the motor can stop as quicker as possible, the deceleration rate is set to infinity, which means the motor will output a desired speed (lower than current speed) immediately.

Appendix A Dimension



Units: mm